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ABSTRACT

Noting that the introduction of Videotex into the United States might precipitate significant public policy choices, this paper argues for a systematic assessment of the new technology and presents a methodological framework for dealing with its social impact. It then discusses 12 preliminary public policy concerns: (1) economic barriers to entry, (2) institutional dislocations, (3) suppliers of information, (4) paying for information, (5) cable television as a videotex carrier, (6) the government as an information provider, (7) setting standards, (8) security and privacy, (9) equity and access, (10) responsibilities of information providers, (11) copyright protection, and (12) regulatory uncertainty. The paper then suggests a three-phase design for understanding the implications of these concerns and for providing a comprehensive overview of the problems and possibilities of Videotex. (Author/FL)

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by

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I. ABSTRACT

The introduction of videotex in the U.S. may precipitate significant public policy choices. This paper argues for a systematic assessment of this new technology and presents a methodological framework. The issue is not to predict the future of videotex but to map the terrain over which videotex might evolve, what policy problems might emerge, and what consequences might result from any particular response. Twelve preliminary public policy concerns are discussed. To understand the policy implications, a three-phase design is suggested. While this methodology would not erase uncertainty, it would provide a comprehensive overview of problems and possibilities of videotex in the U.S.

II. INTRODUCTION

The United States has hesitated to jump into the rush of countries making active commitments to videotex (Ref. 1). Few systematic attempts have been made to explore the potentials and problems of videotex in the U.S. Even the scattered commercial efforts are taking place in isolation from each other.

The U.S. already appears behind schedule in developing a fuller understanding of the broad technical and social consequences of widespread videotex usage. Of particular importance are those public policy decisions which will be faced during the early development of videotex in the U.S. While we cannot predict the future, we can develop a map of the terrain over which the future course of videotex will

be played out--a map that does not offer any prescriptive paths but suggests what public policy problems might be encountered, where they might occur, and what consequences we might anticipate from particular responses (on the one hand, government intervention; on the other, "let the market decide").

This paper will highlight a dozen areas of public policy concern that would be raised by the introduction of videotex in the U.S. We will then sketch an approach to systematic assessment of these and other social impacts in the context of this new technology. Videotex is not a technology whose effects will be understood easily; it has both extrapolative and transformative properties. The extrapolative effects are the easily recognized first-order effects. For example, the technological advancement of an improved videodisc may result in an increase in the amount of information that can be stored per unit cost. Such effects are often characterized in terms of performance criteria (e.g., speed, size, take-up rate) or in measures such as direct and indirect cost and cost benefits.

On the other hand, transformative effects include the higher-order effects and the unintended or unanticipated consequences of a technological advancement. When photocopying replaced carbon paper as a means of keeping a record of correspondence (first-order effect), the new process revolutionized the dissemination of information and created as yet unsolved problems of copyright infringement (second-order effects).

Historically, new communication and information technologies have produced effects unanticipated by the original entrepreneurs of the technology--effects with far-reaching public policy consequences (Ref. 2). For example, telephony, which began offering competitive services in a fragmented market, evolved into a nationwide system based on the principle of regulated monopoly. The question of balancing service (access) with concentration of power and authority was and still is central to that development.

As videotex will be provided through complexes of computer hardware and software, information banks, and transmission channels, we expect that there will be similar transformative effects (Ref. 3). Because this evolving technology has the

potential to change both the ways in which we use information and the ways in which we think about the world, now is the time to assess its potential impacts.

III. PUBLIC POLICY CONCERNS: A CRITICAL DOZEN

Even without systematic research efforts, it is possible to identify public policy concerns that will be raised by the introduction of videotex in the U.S. Some of these concerns were suggested in the results of an NSF-funded workshop in the summer of 1979 (Ref. 4); others have been raised by ongoing research efforts of the Institute for the Future and other groups. The following list represents our choice of core issues surrounding the nature of extent and the potential impacts of videotex in the U.S.

- **Economic barriers to entry.** The computer and telecommunications industries represent two very different institutions that have typically been isolated from each other. The transition to videotex involves the possibility of new and even more powerful communication conglomerates than are known today. The entry costs may be high on both the communication and computer sides. For example, major capital expenditures are associated with the move to broadband or fiber optic cables. On the computing side, it may be essential that interface standards and protocols be established to prevent a single supplier from monopolizing the market. Major issues involve: What are the consequences of ownership of access to both over-the-air TV and telephone line-carried videotex? What are the effects of various degrees of pricing control by public commissions? What are the implications of providing special public access?

- **Institutional dislocations.** The use of videotex will be determined to a large extent by how effectively it can provide services to consumers compared with existing providers and by how much existing providers can change their own services in response. For example, what are the unemployment and retraining implications if videotex captures a large market share of

insurance sales, stock trading, home-based shopping, transfer of funds, and similar information-based industries?

- **Suppliers of information.** Widespread development of videotex presumes the development of a new industry class--information providers. This class may develop from any number of possible directions: already existing industry groups, such as newspapers, broadcasting, computer software providers, communication carriers, and data-base vendors. Policy questions in this area include: What are the consequences of allowing any group to provide information, regardless of its vested interests? What is the liability of an information provider? What are the conflict-of-interest implications for a carrier to be a content or information provider on its own system? What are the consequences of allowing a broadcast TV station to "lease" its teletext authorization to a third party?

- **Paying for information.** Videotex could require an individual to pay for the exact information he or she wants. For example, if the phone network becomes a principal carrier for videotex services (at least initially), access to telephone billing services would seem essential. One important policy question is: What would be the consequences of requiring telephone companies to provide access to their billing services at regulated costs so that information providers are not excluded from the carrier because of inability to bill?

- **Cable TV as videotex carrier.** Cable TV began as a community antenna service for areas having poor television reception. Over the years, it has grown slowly in the U.S., and only fairly recently did it begin providing services more extensive than retransmission of over-the-air television signals. Cable has excess channel capacity, much of it left unused. For many areas, it might be an ideal carrier of videotex services. Cable companies presently have no obligation to provide access to cable channels. These companies, which are growing rapidly, could be in a major gatekeeping position vis-a-vis videotex in the not-too-distant future. What, then, are the implications for access, type of service, and billing?

- **Government as information provider.** The federal government, along with state and local governments, collects and publishes vast amounts of information intended to be publicly available. Many agencies have new mandates to become more aggressive disseminators of these information resources, while at the same time controlling costs. What are the consequences of the government or a government agency becoming an information provider on videotex systems?

- **Setting standards.** Standards can either be government-sanctioned or voluntary. In the case of broadcast television, the FCC approves all technical changes to the broadcast signal and must also approve of any foreign attachments to the TV set. Standard setting--both domestic and international--is likely to have differing impacts on the various possible developments of the technology. For example, if the FCC approves a standard for broadcast teletext, what might be the consequences of that standard for the evolution of videotex systems?

- **Security and privacy.** Security tensions may be created by the establishment of a very large information system accessed directly by the general public. Just as the telephone network is already being violated by "phone freaks" and just as any computer system seems to implicitly challenge people to break its codes, so it is logical to expect security problems with videotex. What are the implications for password and access codes? What individual rights issues will arise from widespread use of records of personal data? What alternatives are available to guarantee security?

- **Equity and access.** One basic question regarding the widespread use of videotex systems is whether access is guaranteed to those who could meet the fair price. What are the implications of leaving all access decisions to the system's owners and operators as opposed to giving the government the power to determine access? Is there equality of access to input information as well as to take it out of the system? A longer-term issue is ensuring compatibility of existing equipment, subject to reasonable rate of replacement, with proposed technical systems. This is analogous to

the issue of compatibility of black-and-white systems with color television. What are the consequences of developments that are not compatible in terms of transition costs and frictional dislocations?

- **Responsibilities of information providers.** Broadcasters are treated differently under the First Amendment from those who convey information by print. Since they are not the owners but licensees of the public airwaves, they are required by law to act as public trustees. Certain rules have been adopted for broadcasting that are intended to ensure some degree of access to diverse speech by listeners, who have been held also to have First Amendment rights in a free marketplace of ideas. But print media are given absolute discretion to cover any issue they wish or to ignore them all and provide pure entertainment. They can run one-sided ads without any obligation to accept opposing views from those who want to buy space (Ref. 5). What are the implications of this dichotomy on videotex systems with regard to the content of the information they provide?

- **Copyright protection.** In videotex systems, an author's rights are more exposed to violation since the information content can be electronically recorded. What are the implications if libraries, local newspapers, or other commercial enterprises reprint, retransmit, or resell all or part of the information in videotex systems? What are the impacts on the copyright statutes and the government's requirements that copyrighted information be documented?

- **Regulatory uncertainty.** Videotex brings together a highly regulated industry (communication) and a relatively unregulated industry (data processing and computing). Under the current law, the FCC has principal regulatory jurisdiction over broadcast teletext. This body is currently wrestling with the regulatory dividing line between data processing and communication, a line that videotex straddles (Ref. 6). But videotex may also be involved in some way with other governmental bodies, such as the Federal Trade Commission, the Justice Department, the Copyright Tribunal, the National

Telecommunications and Information Administration, the courts, state public utility commissions, and the Comptroller of Currency. The uncertainty here begins with uncertainty about who regulates whom, but even more important are questions about the nature of the regulation. Who monitors the various regulations? How are they implemented? What are the implications of such regulations for suppliers of the service, information providers, information content, and users of videotex? In particular, what areas of regulation are likely to be in conflict or to impinge upon each other?

IV. A DESIGN FOR UNDERSTANDING SOCIAL IMPLICATIONS OF VIDEOTEX

The preceding social concerns should demonstrate the range and nature of the issues raised by the introduction of videotex in the U.S. But this is only a beginning list, and it contains many unanswered questions. A systematic attempt to move toward answers to these and related questions is needed. Such an attempt would, we feel, involve three basic phases of activity.

Phase 1 would focus on the state of videotex development. It would collect forecasts for the computer as well as for the communication component technologies, and would examine combinations of these components representative of feasible alternative developments of videotex technology. Phase 2 would identify key applications of videotex and the public policy issues these applications might raise. Phase 3 would examine the decisions that might be made in response to the public policy issues, evaluate consequences of alternative decisions, and trace a range of paths for videotex. Each path would represent a possible transition from the present to a likely future state and would be described in terms of specific videotex technologies, applications areas, and public policy issues.

Phase 1: Technology Description

The purpose of this phase is to describe the current state of the technology, expand the list of technological components to include future components, and then develop forecasts of these technological components that describe the expected future state of videotex. The focus is on supply of the technology.

This phase requires a detailed description of all of the technological components that are now included or being proposed for use within videotex systems. For example, computer hardware options will include CPU and memory chips, and storage devices such as bubble memory and videodiscs; alternative modes of distributing signals will include fiber optics and microwave and satellite transmission capabilities. In addition, it requires a description of the institutions that may be associated with the videotex industry, including its support service suppliers (i.e., carriers) and information providers.

Specifically, each technological component must be examined in terms of its technical requirements, cost, performance characteristics, and compatibility with other components. The description of the institutions should focus on status (public, private); size; type of employment, including skill base; product line; technical capabilities; and performance measures.

Phase 2: Videotex Environment

The videotex environment is responsive to technological change but also itself influences the change. This phase is directed toward the production of a description of this environment that identifies current videotex applications and services for which videotex may become an alternative, searches for new potential applications and users of videotex, and determines the likely public policy dimensions (legal, political, economic, and social) of these applications. The important issue here is the demand for the technology and the public policy consequences of matching supply and demand.

Videotex systems are expected to provide a wide range of information services, many of which may compete with existing information providers (electronic newspapers vs. periodicals) and others that will be relatively new (electronic funds transfer, home shopping). These systems are in fact not limited to information services. They can be transactional services, message services, educational services, home security, fire protection, or even entertainment services. It is important to identify such services, the likely providers, and the anticipated user groups.

Though the U.S. has been noticeably behind other countries in developing and testing videotex systems, early trials and prototype systems have begun to emerge. These current videotex applications may provide important clues for future applications.

While the examination of non-U.S. experience and current U.S. trials of videotex will indicate a number of applications, it may well be that these are more weighted toward extrapolative than transformative changes. To counteract this tendency, it is important to approach the search for applications from the standpoint of anticipated future information needs. By matching various needs with different technological combinations, one can hope to discern radically different applications for teletext and videotex.

To identify possible videotex services and applications associated with transformative changes in society, we suggest the construction of a series of scenarios for the year 2000. These scenarios, comprising both events and trends, would describe various ways information might be provided and used in future social settings. They would provide the major "what if" or alternative contingencies for later evaluations.

Phase 3: Building the Decision Model and Integrating the Results

The information collected in Phases 1 and 2 should be integrated to produce a critical path policy decision model. The goal here is the identification of critical decision points influencing alternative developments of videotex. The output from earlier phases provides a set of videotex technology forecasts, scenarios showing possible

applications of the technology, a matching of the technology forecasts with the scenarios, and a number of associated merging policy issues for each matching.

Our aim in this phase is to integrate the information in terms of a critical network of key public policy decisions (i.e., possible policy responses for each policy issue). We would construct a series of critical paths linking specific policy decisions to videotex applications and to the initiating technology. As the timing of decisions and of particular policy outcomes is uncertain, probability distributions would indicate the timing of the decisions.

Four basic questions are being addressed here for each scenario/technology mix. What policy actions, if any, are necessary? What is the time horizon for such actions? Who may take these actions? What are the consequences of such actions? Consider, for example, the steps to be taken to identify appropriate policy options (Ref. 7). We might logically ask:

1. What are the alternative public policy options for each broad policy issue? These may include regulations, legislation, stipulations, etc.
2. Is there any current organization that could deal with the policy options (i.e., identify a decision maker)?
3. Are there current procedures for implementing the options?
4. How long would the implementation process take? Are there alternative ways of proceeding?
5. If we implement the policy, what other public policy areas will be affected?
6. Who is affected and how are they affected by the option?
7. Which of the alternative policy options is most feasible?
8. What are the broad societal implications?

An issue's sensitivity will be a function of the issue's interdependency with other decisions and options, of its general probability of occurrence, and of the amount of effort likely to be required to activate it.

In order to identify the possible decisions, one might construct a matrix relating public policy issues to the charters of various decision makers. By analyzing the mandate of each decision maker, we can determine first whether the decision maker is likely to be involved with the issue, and then second, what options are available to each decision maker in response to particular policy questions.

This information would enable the construction within each videotex application area of a critical path of the decision process. The decisions in this instance are the activities in the path, and the probability distributions estimated for each decision enable us to compute bounds on the decision occurrence time. In this way, it is possible to approximate critical path analysis with uncertain activity times (Ref. 8).

In order to focus on the key or critical decision points, it is important to assess subjectively the likely impact of each possible decision on the implementation of the particular videotex application. Impact can be assessed as a function of dimensions such as: **timing** (e.g., likelihood that the decision could delay the time of implementation); **complexity** (in terms of warranties, conditions of sale); and **associated additional cost.**

This approach to impact analysis has been developed by Tydeman and Mitchell (Ref. 9) and was recently applied to a study of the impact of technological change on public libraries (Ref. 10).

A major output of this phase would be an early warning mechanism for videotex public policy assessment. The above information could be reformulated to address such questions as: When is the latest time for implementing cost-effective policy control for each of a given set of likely developments? What are the consequences of delay? This framework would provide a way of representing the interface between technology and the environment in terms of basic available choices.

Finally, this phase would produce three key transition paths for the technology. These would be linked to the three most important "what if" pictures or scenarios of the future. The intent here would be to integrate the findings of the critical decision

point analysis within the postulated paths for technology development. In particular, it would be important to identify the technology impacts on: **existing industries** (structure, labor movements, productivity, retraining); **competing communication industries; information-producing industries;** and **societal/lifestyle aspects** (including ethical considerations).

For each path, it could be important to consider likely policy responses and initiatives--in particular, institutional, regulatory, and legislative responses.

The rationale for this approach is that the critical decision point analysis explores the public policy aspect of the videotex phenomenon within each individual technology/application scenario area. What is missing is how the market will grow, what services will be provided, and other information necessary to translate the decision points from the abstract to the real world. A linking of the various application areas also needs to be undertaken. For example, many of the decision points may be conditional both on previous decisions and on specific conditions. Hence, they need to be interpreted and understood in a specific flow of events.

The meshing of the various videotex application areas would be determined by identifying the "linking" decision points (i.e., the decisions that are common to a number of technological developments and application areas). The degree of linking may be determined by matrix connectivity analysis (Ref. 11). By constructing interaction matrices (between decisions, between application areas), it is possible to identify all paths of given lengths connecting the components. This would provide a structure from which to generate particular cases.

V. CONCLUSION

This three-phase design would provide a systematic view of the public policy implications of videotex in the U.S. It would not erase uncertainty, but it would provide a comprehensive overview of problems and possibilities. The current lack of videotex activity in the U.S. might be turned to advantage if this period becomes

one of active exploration. Videotex is promising enough to deserve careful exploration, even if development options are not pursued in this country. If such longer-range perspectives are ignored, we as a country shall continue to back into the future of videotex, moving only in fits and starts as commercial ventures dictate.

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VII. BIOGRAPHIES

John Tydeman: A systems analyst and operations researcher with a Ph.D. in mathematical statistics from the University of Lancaster, Dr. Tydeman is the principal investigator for a study involving a comprehensive technological assessment of teletext and videotex. His other activities include structural modeling and the application of futures research methodology to the design of health delivery systems.

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